

Is Australia progressing towards Ecologically Sustainable Development?

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Abstract

In December 1992, all Australian governments endorsed the National Strategy for Ecologically Sustainable Development. As no indicators were set in the National Strategy, Australia's progress towards Ecologically Sustainable Development has been difficult to measure.

This paper addresses the questions:

- Assessed against the quality standards set in Bellagio Principles, are National Headline Sustainability Indicators a good set of Sustainability Indicators?
- On the basis, primarily, of the National Headline Sustainability Indicators, is Australia progressing towards Ecologically Sustainable Development?

Major weaknesses in the National Headline Sustainability Indicators versus quality standards for sustainability indicators are identified.

The paper then assesses the indicators chosen against the objectives in the National Strategy for Ecologically Sustainable Development. It concludes that the version of Ecologically Sustainable Development reflected in the National Headline Sustainability Indicators is a weak version of sustainability.

Based on the National Headline Sustainability Indicators, all of the economic indicators and some of the social indicators show some progress since 1992. Most of the key National Headline environmental indicators have no trend data. Those with trend data, however, show an adverse trend.

The major conclusion is that Australian society will require a new environmental paradigm to make significant progress towards Ecologically Sustainable Development.

1 Introduction

In December 1992, following the World Summit for Sustainable Development (WSSD) in Rio, all Australian governments endorsed the *National Strategy for Ecologically Sustainable Development* (NSED) (Australian Government 1992). The NSED had 3 Core Objectives (detailed later) and 75 other objectives.

One of the 75 objectives was to develop appropriate performance measures “as a means of indicating overall progress towards ESD” (Australian Government 1992). Despite this, it was not until 2000 that a report on a proposed set of National Headline Sustainability Indicators (NHSI) was published (ABS 2000). In June 2002, just prior to the Johannesburg WSSD, Environment Australia published the inaugural NHSI report (Environment Australia 2002).

This paper seeks to assess the quality of NHSI and the extent to which they provide an appropriate basis for assessing Australia’s progress towards Ecologically Sustainable Development (ESD) over the last decade. It then uses the NHSI and some other relevant indicators to assess what progress Australia has made towards ESD.

2 Assessment of the NHSI

2.1 Quality Assessment of NHSI based on the Bellagio Principles

The Bellagio Principles (Hardi 1997) are a set of 10 quality standards in relation to measuring and assessing progress toward sustainable development. An international meeting of sustainability indicator experts convened by the International Institute for Sustainable Development, in Bellagio, Italy in 1996, developed these principles. The Bellagio Principles are a highly regarded set of quality standards for sustainability indicators (The Earth Council 1997; Bell and Morse 1999).

The principles provide an excellent framework to use for assessment of the Australian NHSI. In the following section of the paper the NHSI will be assessed in relation to each of the 10 Bellagio Principles.

Principle 1: What is meant by sustainable development should be clearly defined

The NHSI were developed specifically to address the three Core Objectives of the NSED and their component parts. Table 1 shows the 3 Core Objectives of the NSED and the 22 Key Aspects that were developed to represent the component parts of these objectives as part of the development of the NHSI.

As will be discussed later in the paper, there could be a range of definitions of ESD that are covered by the NSED Core Objectives.

Principle 2: Sustainability should be viewed in a holistic sense, including ecological, social and economic components

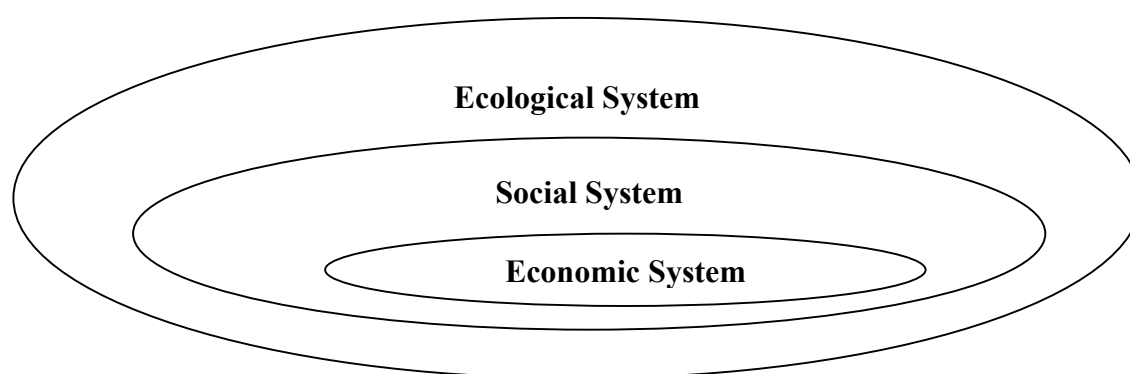
The NHSI includes ecological, social and economic indicators, and Table 1 includes a classification of each of the NHSI as ecological, social or economic. The NHSI report does not make this classification.

The principle also states that in relation to holistic assessment that the assessment should include a review of the whole system as well as its parts. The NHSI have a focus on parts of the system and not the whole system.

Without the planet's basic life support system there can be no society and no economy, so the social system therefore is contained within the ecological system. The economy only works to serve some of society's needs and therefore fits within society.

The appropriate system model for review the whole system should therefore be based on a nested system model as illustrated in Figure 1 below.

Figure 1: Nested System Model



This system model recognises the economy is only a model of part of society which fits within society and that human society is totally constrained by the natural ecology. It is adapted from Professor Ian Lowe's work that was included in the 1996 Australia: State of the Environment Report (State of the Environment Advisory Council 1996).

Principle 3: Essential Elements - Notions of equity should be included in any perspective of sustainable development

The NHSI do not deal with over-consumption and poverty or human rights as specified in the full text of the principle. Six of the seven NHSI classified as Social NHSI shown in Table 3 do relate to notions of equity. These relate to educational, gender, health and locational (urban versus remote) equity, education and drinking water quality.

Principle 4: Adequate scope in terms of time horizon and geographic scope

Australia is unusual in having no land borders with any other country. The only global issue addressed in the NHSI relates to greenhouse gas emissions and it does not

address any issues of global poverty and related issues. It does, however, adhere to the part of the principle that relates to defining “the space of study large enough to include not only local but also long distance impacts on people and ecosystems” (Hardi 1997).

The time horizon should be long enough to capture both human and ecosystem time scales. The time scale used is mainly the ten years since the 1992 NSESD, although for some NHSI the time series data provided includes data from the period prior to 1992. This is probably sufficient to make some assessment even in relation to relatively slow-moving ecosystem indicators.

Principle 5: Practical Focus - Progress towards sustainable development should be based on the measurement of 'a limited number' of indicators

There are 26 NHSI related to 22 aspects of the 3 Core Objectives of the NSESD, which represents an explicit organizing framework that links vision and goals to indicators and assessment criteria. The aspects and related indicators chosen for each Core Objective reflect a set of assumptions and values about what ESD means in practice. What is not clear is whether the NHSI measure the particularly important, critical or salient aspects of ESD. Whether these are the most critical aspects depend on how ESD is defined. The aspects and NHSI chosen represent indicators and measures of progress towards on particular version of ESD will be discussed later in the paper.

The interim NHSI for the Management of Agriculture (Indicator 5 in Table 2) may not be a good indicator of what is an important aspect of ESD. This interim indicator for the Management of Agriculture represents the net value of rural land. The fact that the value of rural land is increasing in value does not seem to be a meaningful measure of ecologically sustainable management of agriculture in Australia.

The principle also states that the indicators chosen should be able to be compared with targets, reference values, ranges, thresholds, or direction of trends, as appropriate (Hardi 1997). For each of NHSI, there is a desired trend – either up or down. The problem is that the direction of change for some NHSI may be in the right direction but the trend may not be fast enough to avoid significant environmental problems. For some NHSI, it would be appropriate that more specific targets as well as desired trends were established. Trends only provide a relative frame of reference and for some indicators an absolute frame of reference (eg targets, thresholds) is also required. The Air Quality NHSI (Indicators 6 & 7 in Table 2) exemplify the problem of using only a relative framework; they may show an improving trend, but the trend may not be rapid enough to avoid significant health problems.

As a further example, the Management of Energy Headline Sustainability Indicator (Indicator 2 in Table 2) is flawed as it only shows the renewable energy use as a percentage of total energy used. Even if it was moving in the right direction, the increase in total energy use could be large enough to make the total non-renewable energy use still increase. The desired trend should be downwards for total energy use or energy intensity (energy use/production). The latter is used in the Swedish

Sustainable Development Indicators (Statistics Sweden & the Swedish Environmental Protection Agency 2001)

Despite the NHSI report claiming that the NHSI chosen are “reliant on data that are already available in other contexts”, for 2 of the NHSI no data will be available for the foreseeable future (Environment Australia 2002). For a further 2 NHSI no data is available so interim indicators have been used, and for a further 11 of the 26 NHSI no trend data is available. In other words, only 11 of the 26 NHSI meet the self-proclaimed criteria for inclusion.

Many of the NHSI therefore do not conform to the part of this Bellagio Principle that states that the indicators should show trends or be able to be compared with a target, particularly over the last decade since 1992.

Principle 6: Openness: Methods and data employed for assessment of progress should be open and accessible to all

Almost all of the NHSI meet this criteria as they are based on established statistical sources and methodologies, details of which are available from the various organisations which prepare and publish the indicators.

One exception is related to the Management of Agriculture where the indicator “Net Value of Agricultural Land Use”, which is not yet available. The NHSI report also notes that the National Land & Water Resources Audit is currently developing the methodology and data for reporting against this indicator (Environment Australia 2002). When this is available, it may be easier to understand the method of assessment underlying this NHSI.

Principle 7: Effective Communication: Progress should be effectively communicated to all decision-makers, users and audiences

The NHSI report uses reasonably clear language although for someone unfamiliar with ESD and indicators, there may be some problems in fully understanding the report due to its widespread use of technical terms.

Environment Australia (EA) has made the report available on its internet site as well as making the published report available free of charge. The NHSI report received much less attention and media coverage than the State of the Environment Report that was also released by EA earlier in 2002.

Principle 8: Broad participation is required

This principle states that broad participation is required by key grass-roots, professional, technical and social groups, including youth, women, and indigenous people - to ensure recognition of diverse and changing values. The principle also requires participation of decision-makers to secure a firm link to adopted policies and resulting action.

The NHSI report claims, “the indicator set has been developed in consultation with all Commonwealth agencies, other jurisdictions, key stakeholders and the general public.” (Environment Australia 2002) In response to an enquiry made by the author, EA commented that no documentation of the consultation process on the NHSI was available. The consultation process therefore seems to have been very limited, particularly compared with the process by which the NSESD was developed and the process currently taking place in Canada to develop sustainable development indicators. Both of these processes are discussed in more detail below.

The NSESD process, involved 9 working groups each chaired by an independent academic or scientist, with 149 members from government, industry, trade unions, other NGOs, universities and CSIRO (Commonwealth Scientific and Industrial Research Organisation). Although the majority (78) of the working group members were federal or state government officials; there was, however, still significant participation in the working parties by non-government members. The community participation in the NSESD process was limited but in the second half of the process, a newsletter was produced and public consultation meetings on ESD were held in several cities (Diesendorf and Hamilton 1997).

In February 2000, the Canadian Federal Government committed C\$9 million (A\$10m) to develop a national set of indicators. The Canadian Environment and Sustainable Development Indicators (ESDI) Initiative is a three-year multi-stakeholder program to develop and promote feasible and nationally accepted sustainable development indicators. Research, public consultations and analysis by subject experts are all part of the process, which will conclude in March 2003 when the Canadian Government will be asked to respond to the ESDI Initiative recommendations (Smith and Choury 2002).

The Canadian ESDI Initiative approach would appear to represent the broad participation required by this principle. The Australian NHSI process did not have a well-defined approach for ensuring broad participation.

Principle 9: Ongoing assessment through determining trends, with continuous improvement to measures, frameworks and goals based on new insights into complex systems

Most of the Australian NHSI can determine trends. Trend data, however, is not available for half of the NHSI for the decade since 1992 when the NSESD was endorsed. The part of the principle that relates to collective learning and continuous improvement of the indicators, goals and frameworks and decision-making, based on

new insights gained into the complex ecological and other systems, has not been addressed.

Principle 10: Institutional capacity in order to monitor progress towards sustainable development needs to be assured

Although Australia has the resources to monitor progress, it took 10 years from the endorsement of the NSESD to prepare the first NHSI report and there is no clear indication how regularly Australia's progress towards ESD will be monitored using the NHSI.

There is also no indication of how the outcomes of the first NHSI report are communicated to and acted upon by any of the levels of Australian government.

2.2 Are the NHSI a good set of Sustainability Indicators?

Reviewing the above assessment, there are clearly some major weaknesses in the NHSI versus the quality standards for sustainability indicators set out in the Bellagio Principles.

The next section of the paper will focus on the assumptions made in relation to ESD that underlie the NHSI. This will lead to an assessment of the implicit version of ESD to which the NHSI relate.

It will also compare the ESD version implicit in the NHSI with other possible versions and definitions of ESD. It will also review some other indicators that could also be used to measure progress towards the Goal and Core Objectives included in the NSESD.

3 NHSI versus NSESD Core and Other Objectives

3.1 NSESD's Goal and Objectives

The NSESD had the following goal "Development that improves the total quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends." It had three Core Objectives (shown in Table 1), which as noted previously were used as the framework for developing the NHSI. It also had 75 other objectives across a wide range of ESD issues (Australian Government 1992). These other objectives have not been a particular focus for headline or other indicators of progress over the decade since 1992.

The framework of the 3 Core Objectives will be used to examine the NHSI and to assess the assumptions in relation to ESD on which they have been based.

Core Objective : To Enhance Individual and Community Well-Being and Welfare....

The most critical and questionable assumption made in the NHSI report is that economic growth (as measured by GDP-related indicators) represents a path of economic development that is likely to achieve this objective. There is ever increasing evidence that in developed countries, such as UK, Canada, USA and Australia, GDP growth is not a good measure of increased individual and community well-being. Much of the work in this area by the leaders in the field of ecological economics, such as Herman Daly and Robert Costanza, is well summarised in the two books, *The Growth Illusion* (Douthwaite 1999) and *Shovelling Coal for a Runaway Train* (Czech 2000). The next section of the paper critiques the NHSI related to the first part of this Core Objective from an ecological economics perspective.

Three of the five Economic NHSI (included in Table 4 - Economic NHSI) relate to measures of economic (Gross Domestic Product (GDP) based) growth.

One of the most obvious problems with using GDP related indicators to measure progress is that GDP does not distinguish between costs and benefits, between productive and destructive activities, or between sustainable and unsustainable developments. GDP also includes a large component of activities that clearly do not enhance well-being and welfare. For example, costs from road accidents, divorces and repairing damage from storms and bushfires all add to GDP. In addition, GDP puts zero value on such things as family breakdown and crime, the destruction of farmland and entire species, unemployment, underemployment and the loss of free time. This problem has been recognised for at least 30 years, since Nordhaus and Tobin prepared their Measure of Economic Welfare (MEW) for the United States in 1972 (Nordhaus, Tobin et al. 1972).

Figure 2



Source: (Brink and Zeesman 1997)

In a Canadian context, Figure 2 shows the Index of Social Health (a measure of individual and community well-being and welfare) not increasing with GDP since the 1970s. The indicators diverged in the 1970s and have followed opposite paths since, with GDP continuing to increase and the Index of Social Health declining. Both the US and Canadian version of the Index of Social Health show a similar pattern of ceasing to follow the upward trend of GDP since the 1970s (Brink and Zeesman 1997).

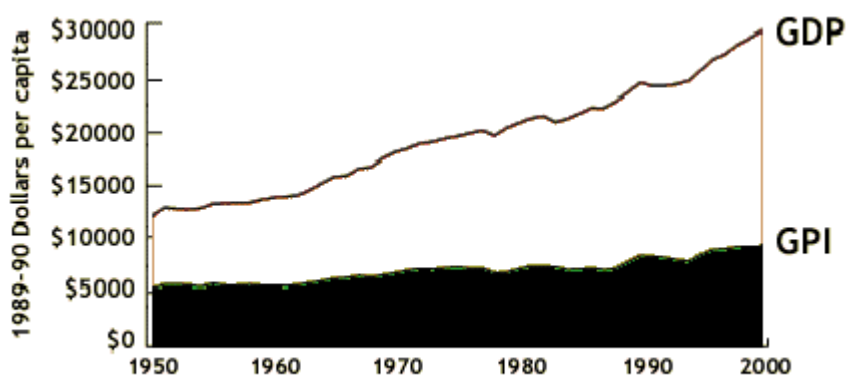
It is beyond the scope of this paper to assess how good and appropriate the Index of Social Health is as a national sustainability indicator related to individual and community well-being.

The Index of Sustainable Economic Welfare (ISEW) was pioneered (for the United States) by Herman Daly, John Cobb, and Clifford Cobb in an appendix to Daly and Cobb's seminal 1989 book, *For the Common Good* (Daly, Cobb et al. 1989). The key differences between ISEW, as a measure of sustainable economic welfare, and GDP are that in the ISEW:

- spending to offset social and environmental costs (defensive expenditure) is taken out;
- longer-term environmental damage and the depreciation of natural capital are accounted for;
- the net formation of man-made capital (i.e. investment) is included;
- changes in the distribution of income are included, reflecting the fact that an additional dollar in the pocket means more to the poor than to the rich;
- a value for household labour is included (Mayo, MacGillivray et al. 2002).

The initial US ISEW was revised by Clifford and John in 1994 (*Clifford and John 1994*), and now forms the basis for the Genuine Progress Indicator (GPI). The Australian Institute has provided GPI data for Australia for all of the period since 1992 when the NSESD was endorsed.

Figure 3: Measuring Well-Being in Australia



Source: (Australia Institute 2002) www.gpionline.net

As the above graph shows, our well-being in Australia as measured by the GPI is increasing at a much slower rate than GDP. GDP per capita increased by over 20% from 1992 to 2000 whereas GPI has increased only marginally.

Why does the NHSI use GDP rather than GPI?

Given that GPI data is available for Australia for the period since 1992 and that it is widely regarded as a better indicator of individual and community welfare than GDP-based indicators; this raises the question of why it was not used as an indicator instead of, or in addition to, the 3 GDP based NHSI.

Given the lack of broad based participation and openness in the NHSI process, particularly in relation to selection of indicators, it is impossible to fully answer this question.

The NHSI report uses Real Gross National Income (GNI) per capita as a measure of living standards and economic well-being. GNI is GDP with the minor adjustment of deducting the net income paid overseas. The NHSI report states the following rationale for inclusion of this indicator, “Economic well-being is a crucial element of human well-being because most aspects of well-being in modern human society have to be purchased, including food, water, shelter, health care and many forms of recreation” (Environment Australia 2002). The problem is that GNI per capita is a very poor indicator of whether all Australians have adequate food, water, shelter and health care.

As well as the problems outlined above in relation to GDP (which relate equally to GNI), the growth on a per-capita basis does not provide any information on the distribution of income. The level of poverty in Australia is another indicator that is subject to much debate. It is, however, clear that adequate food, water, shelter and healthcare is not available to all Australians, particularly to many indigenous Australians.

Core Objective (continued).... by Following a Path of Economic Development that Safeguards the Welfare of Future Generations

The NHSI report recognises that progress against this part of this Core Objective is not clear based on the NHSI. It also notes that achieving this and other Core Objectives depends on protecting ecological processes on which life depends and sustainably managing the natural resources on which economic and community well-being depend. Table 1 shows the 8 NHSI included under this part of the Core Objective. This section of the paper will focus on what economic development path is likely to safeguard the welfare of future generations.

Herman Daly is one of the leading ecological economists today to attack the idea that constant economic (GDP) growth is sustainable. He argues that a sustainable society has three characteristics:

- it does not use renewable resources faster than they regenerate;
- it does not use non-renewable resources faster than renewable substitutes are developed for them; and

- it does not release pollutants faster than natural systems can break them down (Daly 1991).

These are largely consistent with the first 3 system conditions for a sustainable society in The Natural Step (TNS) Framework (Holmberg, Robèrt et al. 1996). TNS adds a social conditions that human needs are met worldwide of this and of future generations.

The NHSI report largely avoids the issue of non-renewable resource use, apart from in relation to energy (as discussed earlier in the paper). The Swedish set of sustainable development indicators measures direct material consumption in tonnes per capita, split into renewable and non-renewable resources (Statistics Sweden & the Swedish Environmental Protection Agency 2001).

The NHSI report has some measures of pollutants (greenhouse gas emissions, SO_x, NO_x, particulates) but does not make any assessment as to whether they are being released faster than natural systems can break them down. This relates to the problem discussed earlier in relation to the need for targets as well as desired trends.

The Swedish indicators are more comprehensive and show total waste (household, industrial and mining) and the disposal methods as well as usage of chemicals hazardous to health and/or the environment (Statistics Sweden & the Swedish Environmental Protection Agency 2001). They, however, also do not address the issue of whether the pollutants are being released faster than natural systems can break them down.

The NHSI report includes National Net Worth as an indicator of Economic Security, which is one of the key aspects listed as contributing to this part of the first Core Objective (see Table 1). This NHSI includes the value of all assets (farms, mines, factories, computer software, inventories) less all liabilities (borrowing from overseas, overseas ownership etc). The problem with this financial measure is that, at best, it is only a partial measure of natural capital depletion. The physical measures of fossil fuel consumption, soil erosion, increased salinity, deforestation and loss of wetlands, thinning of stratospheric ozone, increased atmospheric greenhouse gases, groundwater pollution, etc, strongly suggest that natural capital depletion is not fully reflected in this purely financial measure of economic security (England 2000). Almost none of these physical measures showing adverse trends would be included or reflected in the calculation of National Net Worth.

Other indicators (eg Land Clearance and Dryland Salinity) discussed below also reinforce Australia's lack of progress in providing for future generations over the decade since 1992. These indicators were not included in the NHSI, although they seem to meet all or most of the stated criteria for selection of NHSI (Environment Australia 2002). They were included as Headline Indicators in the ABS Report – *Measuring Australia's Progress* (ABS 2002), which was also published in 2002.

Land clearance continues to have a major adverse impact on Australia's biodiversity, soil and water. Land clearing has not only continued since 1992 but the rate of land clearance has increased from approximately 335,000 hectares in 1992 to 470,000 hectares in 1999 (ABS 2002). Assuming the 1999 rate has continued through to 2002

– this would mean that approximately 4.2 million hectares (42,000 sq km) of land have been cleared since 1992. This represents an area approximately two-thirds the size of Tasmania.

The area of Australia at risk from dryland salinity also continues to increase. This has a major adverse impact on agricultural production, water resources, biodiversity, pipelines, houses and roads (ABS 2002). Data is not available on the area of Australia “at risk” of dryland salinity in 1992. It is clear that the area “at risk” increased since then to 4.8 million hectares at risk in 2000 with this projected to increase by 2020 to 6.6 million hectares (66,000 sq km – approximately the size of Tasmania) (National Land and Water Resources Audit 2002).

Core Objective: To Provide for Equity within and between Generations

The NHSI report recognises that the measures it provides do not allow progress to be measured on equity between generations. The gender, educational, health and locational equity measures all relate to equity within generations and are shown in Table 3. Measures related to the distribution of income and wealth or levels of poverty are excluded from the NHSI.

Core Objective: To Protect Biological Diversity and Maintain Essential Ecological Processes and Life-Support Systems

The NHSI report recognises that progress against this objective is not clear. This is mainly due to trend data not being available for most of NHSI included under this Core Objective. The only 2 NHSI, with trend data available, included in this objective, are moving in the wrong direction (Biodiversity and Climate Change) (Environment Australia 2002).

Many of the problems raised in the previous section in relation to both parts of the first Core Objective also are also problems in relation to how the NHSI measure progress towards this Core Objective.

3.2 Version of ESD reflected in the NHSI

The version of ESD that is reflected in the NHSI tends towards “Weak Sustainability” as defined by Bell and Morse (Bell and Morse 1999). Weak sustainability equates to a sort of economic sustainability where the emphasis is upon allocation of resources and levels of consumption, and financial value is a key element of system quality.

The Bell and Morse definitions of weak and strong sustainability represent points towards either end of a continuum. At the weak sustainability end, economic factors tend to predominate and at the strong sustainability end, ecological factors predominate. Ecological factors are often not measurable in financial terms and include physical measures of soil erosion, biodiversity, dryland salinity etc.

If trend data were available for all the NHSI and appropriate targets had been set, a stronger version of ESD would be reflected in the NHSI, as almost all of the Ecological NHSI have no trend data or targets.

The NHSI also fail to recognise the holistic sense of ESD and the nested nature of the economic system within the social system within the ecological system, as discussed previously in relation to Bellagio Principle 2. This issue of the systems perspective of ESD will be explored further in the next section.

4 Assessment of Australia's Progress towards ESD

As noted above, the NHSI tend to represent a set of indicators based on measurement of progress towards a weak version of sustainability.

The NSESD may have tended towards a stronger form or version of sustainability, including this precautionary principle as one of its seven guiding principles. "Where there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation." It does, however, also state that "no objective or principle should predominate over the others" and include in one of the other principles "the need to develop a strong, diversified and growing economy"(Australian Government 1992).

The NSESD may also be seen as a political balancing act, endorsing a precautionary principle to keep the environmental lobby on side while endorsing a growing economy to keep the business lobby on side. The current Australian Federal Government would give more weight to the business lobby and the weaker version of ESD based on the NHSI may reflect that change of priorities.

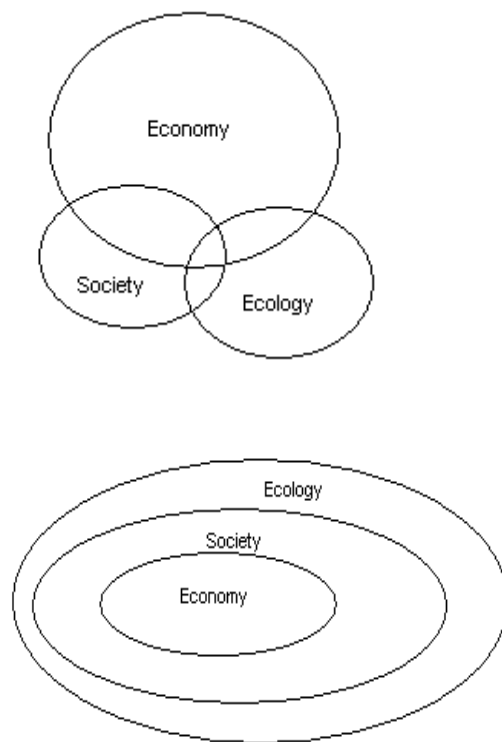
One of the major criticisms made of the original NSESD process (Diesendorf and Hamilton 1997) was that it failed to critically examine the role of economic growth within the context of ESD. The implementation of the NSESD has tended more to apply an economic precautionary principle, where no policies will be implemented where they might adversely affect economic growth. One example is the "no regrets policy" on greenhouse gas emissions that will not implement response measures "that would have net adverse economic impacts nationally" (Commonwealth Government of Australia 1992).

It is not clear whether the NSESD went as far as endorsing the Nested System Model of ESD. It is clear, however, that by 1996 it was recognised that the Nested System Model was required for Australia to progress towards ESD.

Figure 4: Two Different Models of ESD

Overlapping System Model of ESD

Nested System Model of ESD



Source: (State of the Environment Advisory Council 1996)

The *1996 Australia: State of Environment Report* describes the left hand diagram as “the predominant model of decision making in Australia until the 1980s. It gives primacy to economic decisions and assumes that environmental problems can always be solved if the economy is sound” (State of the Environment Advisory Council 1996). Using Milbrath’s terminology (Milbrath 1994), it represents the Dominant Social Paradigm.

The right hand diagram is described as “the decision making model needed for an ecologically sustainable future for Australia. It recognises that the economy is a subset of society, since many important aspects of society do not involve economic activity. Similarly, human society is totally constrained by the natural ecology of our planet. It requires integration of ecological thinking into all social and economic planning” (State of the Environment Advisory Council 1996). Again using Milbrath’s terminology, it represents the New Environmental Paradigm (Milbrath 1994).

Without the planet’s basic life support system there can be no society or no economy. The economy is a social construct – it is not an end in itself. The economy only works to serve some of society’s needs and therefore fits within society. The economy may have to be redefined to be sustainable in order to achieve ESD.

In order for Australia to be progressing towards ESD, we need to be sure that Australian society and economy is remaining within the limits imposed by natural ecology.

Trend data is not available for most of the Ecological NHSI. This could be viewed as a concern in itself as societies tend to measure what they value. This may indicate that Australian society is not giving sufficient focus to the ecological aspects of ESD.

As shown in Table 2, trend data is only available for 4 of the 14 ecological indicators, 3 of which are moving in the wrong direction. The validity of the only Ecological NHSI (Management of Agriculture), moving in the right direction, is also questionable (as discussed previously).

Other environmental indicators for which trend data is available, such as Land Clearance and Salinity (discussed previously) also reinforce Australia's lack of progress towards ESD, particularly in relation to the critical ecological issues over the previous decade.

5 Conclusion

When assessed using the quality standards for sustainability indicators set out in the Bellagio Principles, the Australian NHSI fail to meet many of these quality standards.

The aspects and NHSI chosen to measure progress against the three Core Objectives of the NSESD tend to represent a weak version of ESD.

The NHSI report is based on the dominant social paradigm represented in the overlapping system model, which suggests that social, environmental and ecological problems can be solved while continuing economic growth.

Australian society will require a new environmental paradigm to make significant progress towards ESD. This new environmental societal paradigm will help generate a better set of indicators which will show whether Australia is maintaining the natural ecology on which our life-support systems and society depends.

**Table 1 - Core Objectives with Key Aspects classified
as Ecological, Social and Economic**

Core Objective:

To enhance individual and community well-being and welfare

Key Aspect	National Headline Sustainability Indicator	Ecological, Social or Economic
Living standards and economic well-being	Gross National Income (GNI) per capita (GNI =GDP less net income paid overseas)	Economic
	Gross per capita disposable income	Economic
Education and skills	Percentage of people aged 25-64 who have attained upper secondary and/or attained post secondary qualifications including vocational training	Social
Healthy living	Disability adjusted years life expectancy (DALE)	Social
Air quality	Number of occasions where concentrations of pollutants exceeded NEPM standards for ambient air quality in major urban areas	Ecological
	Total SO _x , NO _x and particulate emissions	Ecological
Drinking water quality	The proportion of the Australian population with access to drinking water systems by settlement type and quality	Social

Core Objective: (continued)

....by following a path of economic development that safeguards the welfare of future generations

Economic capacity	Multi-factor productivity (Gross product per combined unit of labour and capital)	Economic
Industry performance	Real GDP per capita	Economic
Economic security	(i) National Net Worth (ii) National Net Worth per capita	Economic
Management of water	(i) Surface water units within 70% of sustainable yield (ii) Ground water management units within 70% of sustainable yield	Ecological

Management of forests	Total area of all forest type	Ecological
Management of fish	Percentage of major Commonwealth harvested wild fish species classified as fully or under fished.	Ecological
Management of energy	(i) Renewable energy use as a proportion of total (ii) Total renewable and non-renewable energy use	Ecological
Management of agriculture	Net value of rural land (Interim indicator - Agreed indicator: 'net value of agricultural land use' not yet available)	Ecological

Core Objective:**To provide for equity within and between generations**

Economic and gender equity	Adult female full time (OT) average weekly earnings as a proportion of adult male full time (OT) average weekly earnings	Social
Economic and educational equity	Percentage difference in the year 12 completion rate between bottom and top socio-economic decile	Social
Economic and health equity	(i) Percentage difference in burden of life years lost due to disability between bottom and top socio-economic quintile. (ii) Percentage difference in burden of life years lost due to mortality between bottom and top socio-economic quintile	Social
Locational equity	Percentage difference in the year 12 completion rate between urban and remote locations	Social

Core Objective:**To protect biological diversity and maintain essential ecological processes and life-support**

Biodiversity and ecological integrity	Extent and condition of native vegetation, freshwater habitats, coastal habitats, estuarine habitats and marine habitats including extent to which represented in reserves and non-reserve systems. Actual indicators used: (i) Proportion of (354) bio-geographic sub-regions with greater than 30 per cent of original vegetative cover	Ecological
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	(ii) Proportion of (354) biogeographical sub-regions with greater than 10 per cent of the sub-region's area in protected areas	
	Number of extinct, endangered and vulnerable species and ecological communities. Actual indicators used: (i) Number of extinct, endangered and vulnerable species (ii) Number of endangered ecological communities	Ecological
Climate change	Total net greenhouse gas emissions	Ecological
Coastal and marine health	Estuarine condition index - proportion of estuaries in near pristine or slightly modified condition	Ecological
Freshwater health	Proportion of assessed sites which are with high in-stream biodiversity, based on macro-invertebrate community structure (Interim indicator - Agreed indicator: 'river condition index' not yet available)	Ecological
Land health	Catchment Condition Index - proportion of assessed catchments that are in moderate or good condition	Ecological
	Area of land affected by land degradation	Ecological

Table 2: Ecological – National Headline Sustainability Indicators (Environment Australia 2002)

Key Aspect (1)	Ecological (1) – National Headline Sustainability Indicator	Data	Desired trend	Actual trend over last decade (if known)
Climate change	1. Total net greenhouse gas emissions	458.2 Mt	Down	Up
Management of energy	2. (i) Renewable energy use as a proportion of total (ii) Total renewable and non-renewable energy use	5.8% 4858 PJ	Up Not Specified (1)	Down Up (1)
Biodiversity and ecological integrity	3. Extent and condition of native vegetation, freshwater habitats, coastal habitats, estuarine habitats and marine habitats including extent to which represented in reserves and non-reserve systems. Actual indicators used: (i) Proportion of (354) bio-geographic sub-regions with greater than 30 per cent of original vegetative cover (ii) Proportion of (354) bio-geographical sub-regions with greater than 10 per cent of the sub-region's area in protected areas	84% 26%	Up Up	
	4. Number of extinct, endangered and vulnerable species and ecological communities. Actual indicators used: (i) Number of extinct, endangered and vulnerable species (ii) Number of endangered ecological communities	1560 23	Down Down	Up
Management of agriculture	5. Net value of rural land (Interim indicator - Agreed indicator: 'net value of agricultural land use' not yet available)	\$111.7bn	Up	Up
Air quality	6. Number of occasions where concentrations of pollutants exceeded NEPM standards for ambient air quality in major urban areas	98	Down	
	7. Total Sox, Nox and particulate emissions	3.6b kg	Down	
Coastal and marine health	8. Estuarine condition index - proportion of estuaries in near pristine or slightly modified condition	72%	Up	

Freshwater health	9. Proportion of assessed sites which are with high in-stream biodiversity, based on macro-invertebrate community structure (Interim indicator - Agreed indicator: 'river condition index' not yet available)	60%	Up	
Land health	10. Catchment Condition Index - proportion of assessed catchments that are in moderate or good condition	83%	Up	
	11. Area of land affected by land degradation	No data (1)	Down (1)	
Management of water	12 (i) Surface water units within 70% of sustainable yield	74%	Up	
	(ii) Ground water management units within 70% of sustainable yield	60%	Up	
Management of forests	13. Total area of all forest type	157 m hectares	Up	
Management of fish	14. Percentage of major Commonwealth harvested wild fish species classified as fully or under fished.	37%	Up	

(1) Notes added to original table that relate to material covered in paper.

Table 3: Social – National Headline Sustainability Indicators (Environment Australia 2002)

Key Aspect (1)	Social (1) – National Headline Sustainability Indicator	Data	Desired trend	Actual trend over last decade (if known)
Education and skills	1. Percentage of people aged 25-64 who have attained upper secondary and/or attained post secondary qualifications including vocational training	64.3%	Up	Up
Healthy living	2. Disability adjusted years life expectancy (DALE)	71.16	Up	
Economic and gender equity	3. Adult female full time (OT) average weekly earnings as a proportion of adult male full time (OT) average weekly earnings	84.85%	Up	Unchanged
Economic and educational equity	4. Percentage difference in the year 12 completion rate between bottom and top socio-economic decile	16%	Down	Down
Economic and health equity	5. (i) Percentage difference in burden of life years lost due to disability between bottom and top socio-economic quintile.	41-45%	Down	
	(ii) Percentage difference in burden of life years lost due to mortality between bottom and top socio-economic quintile	26-41%	Down	
Locational equity	6. Percentage difference in the year 12 completion rate between urban and remote locations.	12%	Down	Down
Drinking water quality	7. The proportion of the Australian population with access to drinking water systems by settlement type and quality.	Not available (1)	Up (1)	

(1) Notes added to original table that relate to material covered in paper.

Table 4: Economic – National Headline Sustainability Indicators (Environment Australia 2002)

Key Aspect (1)	Economic(1) – National Headline Sustainability Indicator	Data	Desired trend	Actual trend over last decade (if known)
Living standards and economic well-being	1. Gross National Income (GNI) per capita (GNI =GDP less net income paid overseas)	\$31 847	Up	Up
	2. Gross per capita disposable income	\$31 851	Up	Up
Economic capacity	3. Multi-factor productivity (Gross product per combined unit of labour and capital)	1.1%	Up	Up
Industry performance	4. Real GDP per capita	\$32 636	Up	Up
5. Economic security	(i) National Net Worth	\$2431.40bn	Up	Up
	(ii) National Net Worth per capita	\$127 666	Up	Up

(1) Notes added to original table that relate to material covered in paper.

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References

- ABS (2000). National Headline Sustainability Indicators. Canberra, ABS.
<http://www.abs.gov.au/websitedbs/c311215.NSF/20564c23f3183fdaca25672100813ef1/36f96955a6e59068ca2568f2001ae1cb!OpenDocument#National%20approach%20to%20sustainability>
- ABS (2002). Measuring Australia's Progress Cat No 1370.0. Canberra.
- Australia Institute (2002). The GPIonline, www.gpionline.net - The Australia Institute. **2002**.
- Australian Government (1992). National Strategy for Ecologically Sustainable Development. Canberra, AGPS.
- Bell, S. and S. Morse (1999). Sustainability Indicators: Measuring the Immeasurable. London, Earthscan.
- Brink, S. and A. Zeeman (1997). Measuring Social Well-Being: An Index of Social Health for Canada, Human Resources Development Canada. Applied Research Branch - Strategic Policy.

- Clifford, C. and C. John (1994). The Green National Product. Lanham, Maryland, University of Americas Press.
- Commonwealth Government of Australia (1992). National greenhouse response strategy. Canberra.
- Czech, B. (2000). Shoveling Fuel for a Runaway Train, The University of California Press.
- Daly, H. (1991). Elements of environmental macroeconomics. Ecological Economics. R. Costanza. New York, Columbia University Press.
- Daly, H., J. Cobb, et al. (1989). For the Common Good - redirecting the economy towards community, the environment and sustainable development. Boston, Beacon Press.
- Diesendorf, M. and C. Hamilton, Eds. (1997). Human Ecology, Human Economy, Allen & Unwin.
- Diesendorf, M. and C. Hamilton (1997). Human Ecology, Human Economy. St Leonards, Allen & Unwin.
- Douthwaite, R. (1999). The Growth Illusion. Totnes, Devon, Green Books Ltd.
- England, R. W. (2000). "Natural capital and the theory of economic growth." Ecological Economics **34**: 425–431.
- Environment Australia (2002). Are We Sustaining Australia? Report Against Headline Sustainability Indicators. **2002**.
- Hardi, P. a. Z., Terrence, Ed. (1997). Assessing Sustainable Development: Principles in Practice, International Institute for Sustainable Development.
- Holmberg, J., K.-H. Robèrt, et al. (1996). Socio-Ecological Principles for a Sustainable Society. Getting Down to Earth: practical application of ecological economics. R. Costanza, O. Segura and J. Martinez-Alier. Washington, Island Press: 17-48.
- Mayo, E., A. MacGillvray, et al. (2002). The Index of Sustainable Economic Welfare for the United Kingdom, ICSU - Scientific Committee on Problems of the Environment. **2002**.
- Milbrath, L. (1994). "Stumbling Blocks to a Sustainable Society." Futures **26(2)**: 117-124.
- National Land and Water Resources Audit (2002). Australians and Natural Resource Management 2002. Canberra.
- Nordhaus, W., J. Tobin, et al. (1972). Is Growth Obsolete? Economic Growth, Fiftieth Anniversary Colloquium. National Bureau of Economic Research, Columbia University Press, New York.
- Smith, S. and C. Choury (2002). "Devising Environment and Sustainable Development Indicators for Canada." Corporate Environmental Strategy **Vol. 9**(No. 2).
- State of the Environment Advisory Council (1996). Australia: State of the Environment. Collingwood, CSIRO.
- Statistics Sweden & the Swedish Environmental Protection Agency (2001). Sustainable Development Indicators for Sweden – a first set 2001, Statistics Sweden & the Swedish Environmental Protection Agency.
- The Earth Council (1997). Managing National Sustainability and Strengthening Regional Cooperation - http://www.ecouncil.ac.cr/rio5/forum/english/Day3_5.htm